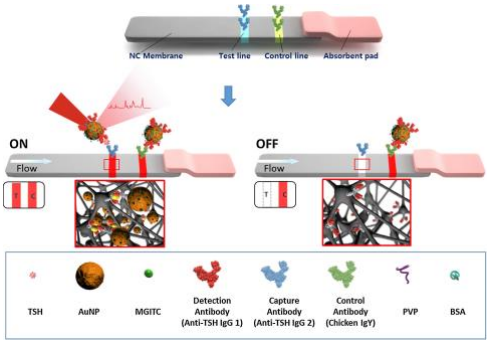
Concordia University
Arts and Science
Department of Physics

TURAK RESEARCH GROUP

Undergraduate research opportunity (Summer 2023/Fall 2023/Winter 2024)
Monodisperse, size tunable Au nanoparticles as functionalized surfaces for biosensors
Department of Physics, Concordia University, Montreal Canada
Centre for NanoScience Research (CeNSR)

The Turak Functional Nanomaterials Laboratory seeks to revolutionize biosensors by making them cheaper, more accessible, and more flexible. Our research focusses on developing easy, versatile, and inexpensive methods of exploring and tuning surfaces using nanoparticle functionalization. To achieve this vision, the Turak group uses simple manufacturing approaches (reverse micelle deposition), allows nature to dictate morphology (entropic self-assembly, beneficial dewetting), and develops characterization tools that are widely applicable to nanotechnology.

In this project, students will utilize novel nanoparticle patterning and surface functionalization methods to increase the density of biorecognition elements and provide enhanced exposure of active sites for protein binding. The research project will target measurements of the thyroid function, utilizing nanoparticle approaches to detect thyroxine, specifically T3, T4, TSH and related antibodies. Incorporation into a biosensing platform will open up many new opportunities with revolutionized accessibility, as it paves the way for portable, point-of care sensors, particularly useful for Canadians with vulnerable immune systems, mobility issues, or those residing in remote locations.



Choi et al. Sensors Actuators B 240 358 (2017)

Tunable Au nanoparticles will be produced using the reverse micelle method. As both nanoparticle size and spacing are critical to achieving specific binding, the student will optimize the size, particle separation and 2D order of the nanoparticles for enhanced binding of proteins on the surface. They will produce particles ranging from 3nm to 70nm, by modifying deposition methods, molecular weight, and solvent. These nanoparticles will be applied directly to gold (Au) plated silicon and glass substrates for direct use, and to polydimethylsiloxane (PDMS) surfaces for integration with microfluidics. The initial use of Au allows conjugation with thiol functionalized species such as self-assembled monolayers (SAMs) and provides an optimal material for various surface characterization techniques. Students will characterize the nanoparticles properties, focusing particularly on size, using atomic force microscopy, scanning electron microscopy, UV/Vis absorption, and surface plasmon resonance techniques.

Students interested in paid (USRA, CURSA, Physics URA, FRQS Awards for Undergraduate Introduction to Research), for class credit (Honors thesis or research experience) or volunteer internships from Physics, Chemistry, Chemical and Materials Engineering, or related areas are welcome to apply.

To apply, please send a letter of interest, CV and contact information for two references in a single pdf document, with email subject **"Turak Lab Project Applicant"**. Only applicants considered for employment will be contacted for an interview. **All applications should be sent to Ayse Turak (ayse.turak@concordia.ca)**